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Dynamics of sympatric vole populations: influence of interspecific competition

Getz, L L ; Ozgul, Arpat ; Oli, M K ; Hofmann, J E ; McGuire, B

Abstract: We conducted removal experiments in open populations of *Microtus ochrogaster* and *M. pennsylvanicus* to test for potential interspecific competition between coexisting populations in bluegrass and tallgrass prairie in east-central IL, USA. Population densities of *M. ochrogaster* and *M. pennsylvanicus* in bluegrass were not suppressed by presence of the other species. In bluegrass, presence of the other species did not negatively influence monthly survival, persistence of young on the site, reproduction, or number of immigrants of either *M. ochrogaster* or *M. pennsylvanicus*. Although *M. pennsylvanicus* appeared to exert a strong suppressing effect on population densities of *M. ochrogaster* in tallgrass and limited the number of immigrants, survival, persistence of young, and proportion reproductively active female *M. ochrogaster* were not negatively affected by presence of *M. pennsylvanicus*. We conclude that interspecific competition did not play a major role in driving dynamics of coexisting populations of *M. ochrogaster* and *M. pennsylvanicus* in our study sites [Acta Zoologica Sinica 53 (5): 800–811, 2007].

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ZORA URL: <https://doi.org/10.5167/uzh-76494>

Journal Article

Published Version

Originally published at:

Getz, L L; Ozgul, Arpat; Oli, M K; Hofmann, J E; McGuire, B (2007). Dynamics of sympatric vole populations: influence of interspecific competition. Acta Zoologica Sinica, 53(5):800-811.

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| R= | ! S"#S%&' 0*% | D'0!%\$++ | 10*5 CTUM | 9)S!6 CTTC | LI &.'6+ | I=L | ITT |
| RX | ! S"#S%&' 0*% | 7)*%\$++ | YI(.: !\$CTUL | H#S% CTUM | XC &.'6+ | LXI | =I= |
| RL | ! S"#S%&' 0*% | 7)*%\$++ | HO0A(CTUM | G! : \$D)\$ CTTC | LX &.'6+ | LM' | =>> |
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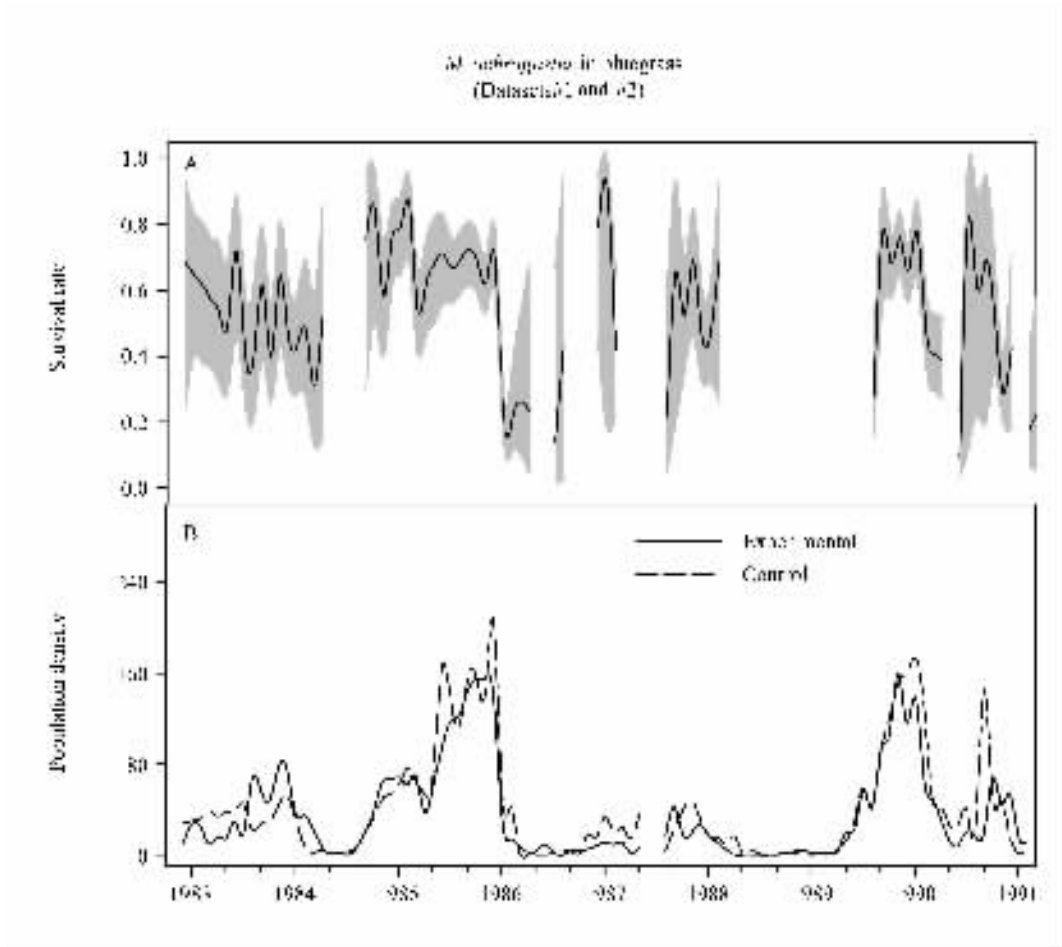
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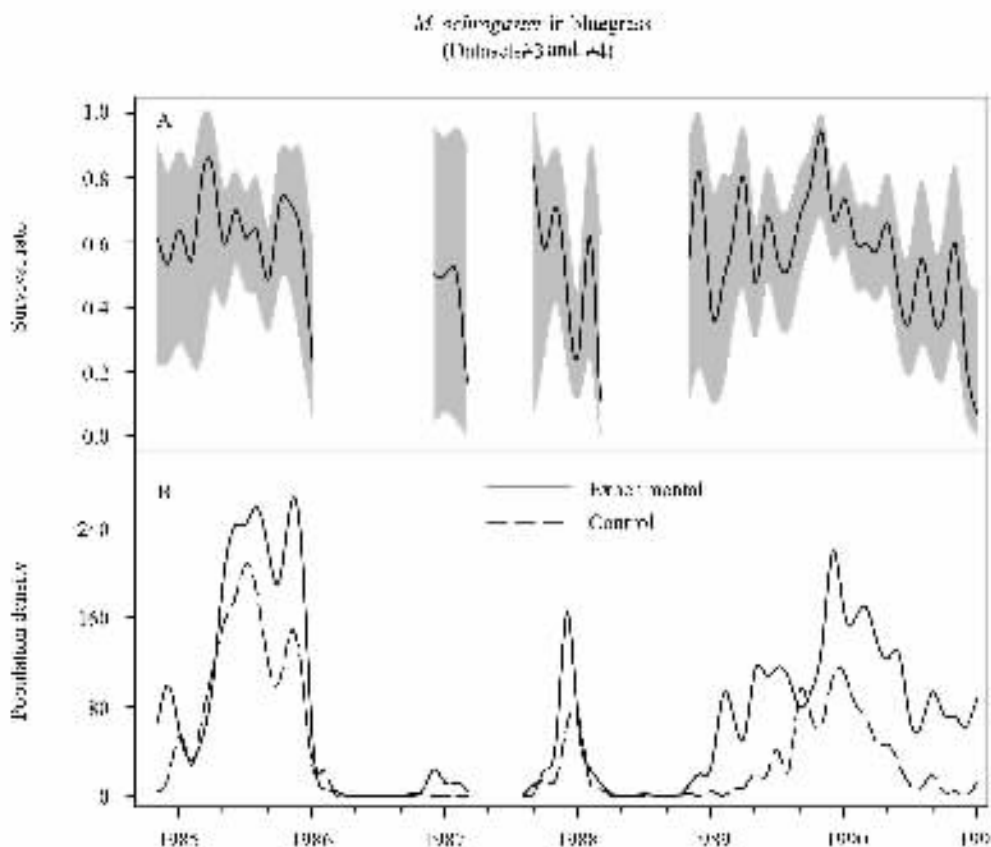
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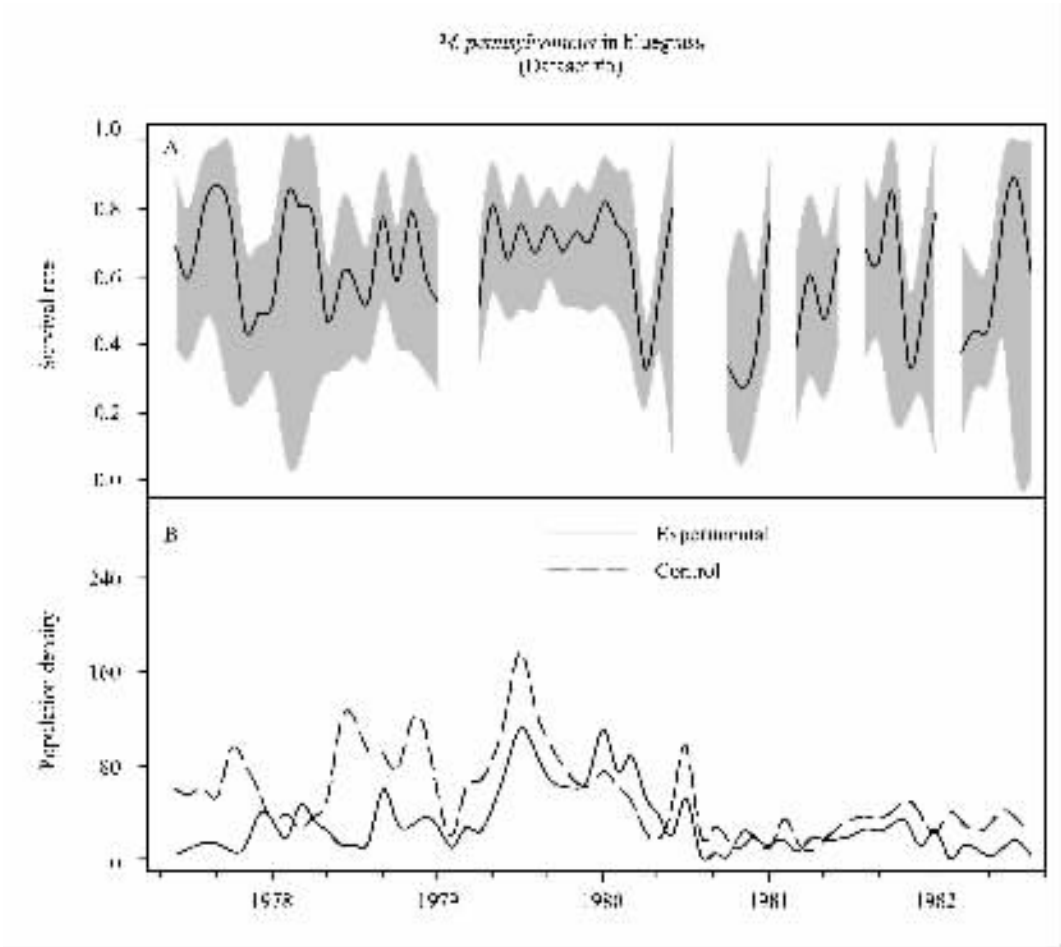
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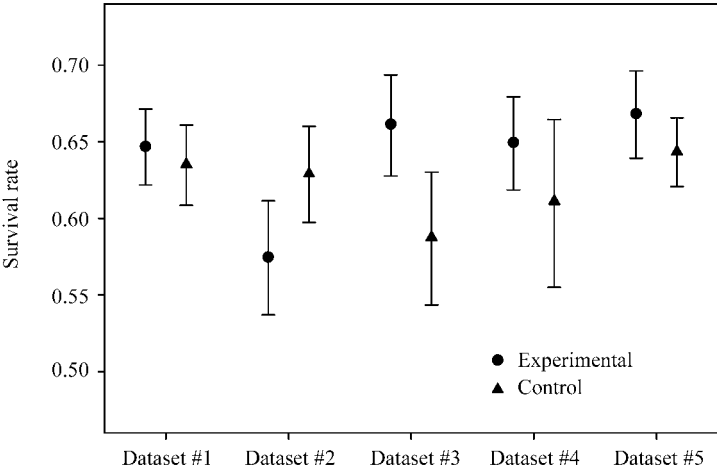
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[\] ^ _ ` { | } ~ ¡ ¢ £ ¤ ¥ ¦ § ¨ © ª « ¬ ® ¯ ° ± ² ³ ´ µ ¶ · ¸ ¹ º » ¼ ½ ¾
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EI#3: &'1! P. : S##-"(IQR/ C6*!31". ,S&-)" +(-6&()'131& '1! +&'S. ###'3 : '(85') DV- "E#&+1 B\$+*N\$ A##'3%&:/ F/A##'3/ SQ I TIKUI TIL/ ; :~3 CV IQQW =NI #* S. #3 ###'3 (S(63-'S1. ' &5*4/ XI A+: 6386% &S(63-'S1: 90&+43. @333: "NUS#1! @263/ G553/ II YS& G3 5*~&E(3*! B+*1+ (RLIURJ/ ; :~3 CV3 700/NI #*~. +31% 6(-S-) 31!+. (" XI ; &E- COX TTRUITQ/ ; :~3 CV O'&BR 71 <Y =.N GE IQQQ/ GM"~#1-3 '13N*. S (S/ -S1/ Z"4 @3. F= "/ G+33W S. B#3B A##'3 -.-) 71!+. (" 7"5"3 GM"~#1-3 E(85+) "/ Z"4 YS& B(81%&8'8% IJSUIWS/ ; &TWG: C&E- O& ; '8E= (IQSK A#(S&1+ S. 5%~. "5+ S5'E-S ! "S%& (+N3/ G+33W/S I JTLUI JI/ ; 6& #< &EI'&S1 =Q WUW AS!3 B3+*S1 '1! A63#S!3 XI. &1+ %W! !18& Z"4 YS& B(81%&8'8% ; 6& O& IQTJ/ > &S&3D) '5S& '1! (S(63-'S1. S. S#). #3 ###'3 '1. S6) &A+) %1/ P15/A+) / A6. / JS53 A*+ / @6D3/ T/ I U /R/ ;)&-*1 FK IQSI/ @S(63-'S1 '1! *N '1! &(85+5" ~, *~1+N/ ; 33/ 9' (85/ T WTRUQT/ ;)&-*1 FK IQRJ/ GI1&E1' ,'+S& '1 (S(63-'S1 &63-'S1/ XI : S) '1 AZ A'3. 9& <3*1 OC "/ ; S. S+*3 A+) '1. #. S @S(63-'S1 9%63-'S1/ Z"4 O'5'1 Y'3 P15'&N @E. (LKSULRJ/ ; S3 HQ : :~3 CV IQS&/ XI. B'1+ S. 6(3#~1-3. "11% S1 ' 553" (S(63-'S1/ F/A##'3/ [Q RJQURIQ/ ; S3 HQ : :~3 CV IQSQ/ Z6&'S1 '1! (S(63-'S1. S. -) (&'8" 553" ! "S%& (%) % + (& , \$ ' 1 . ' 1 - & 3 X 3 7 1 5 : / F / E 1 # / G + S 3 / T R T J / U T S J / ; S 9A IQKT/ G. #~. S. 6&5'3, &#~. %)-1% S. #&E! '1#3/ ; S#~&2 [I TWUITLR/ ; &4'3 < & @## B& IQSK/ : S#("S1 '1! 1*)).)*. S. #*~ 1-85+6'1 S1-S. #331! / V2S. W5 WJUIWJR/ =8&3. 9& IQSK/ B(-*3 '1- &+S1. '1! #*~& D~-. '3+*S1. S. -4S B+3W. N#(-&+ 553". ! "S%& (- % . &+ . (' 1 ! ' 1 " S % & (1 . . . (0 1 2 + . # (/ G + 3 3 W / S L I K U L I W =6". &9- O'3S1 A& 9& "9- IQRI/ E-@D6". S. !* ("&'1% #'!S4 553". &1 S('1 &E! (S(63-'S1/ E+>) "853/ W& ILQUIKW G++ &E Y3Y'1 O WUW =E+ -1- &E1+ S&1!E+ "M3*~S M E1 "M&E#1-3. 6IN S. ,~1. +S-. S. '1- & ("~*~+ S#("S1 '1 553". / V2S. QQ [RJU/QJ/ G++ &E Y3Y'1 O WUJL/ XI- & ("~*~+ S#("S1 '1. #3 &E! '1. &# (S(63-'S1. S '1!5'163/ G553/ G+33/ IS TWUITJ/ G++ &E Y3Y'1 O WUJD/ O)S D"~&-) +S-. S. '1- & ("~*~+ S#("S1 '1 '1 %~. &+6&E! (S(63-'S1 G+33W R' L WRT U L WJL/ G++ &E Y3Y'1 O WUS/ : S-. S. +S'M. "1+ '3E1' %&E! '1- S. +S#("S&E! "1. *~. '1 "M&E#1-4*) &S'31" &S'1-. / F/ E1# / G+33/ SK K/USI/ C'1". A& A+: 3'1% '1 79 R& IQRJ/ =* ("&'3 '1. #3 ###'3 / E1/ 9'5/ G+33/ BW- / II IKLUIQK/

C"~? 7& IQKW E%&E.. 5" D") '5S& S. -) " #'!S4 '1! (&'8" 553". / F/ A'##'3/ TL L/IU/LR/ C"~? 7& : S3 HQ 8"8& &S OS.#11 R& E5'3. = IQSQ/ : S#('&'S1. S. (S(63-'S1 ! "S%& (%) % + (& , \$ ' 1 . ! ! / 1 . . . (0 1 2 + . # (/ E + >) " 8 5 3 / W & L I Q U L T Q / C"~? 7& IQRJ/ O'D~-. / XI >#&E1 9O "/ ; S3W S. Z"4 OS&E! ! "S%& (/ R (- / @6D3/ E#&B/ RS+ / A'##'3/ R W&KULJQ/ C"~? 7& OS.#11 R& <3--. / & 8"8& &S : S3 HQ 71!85) 9& IQRS/ H86& "1 N"~& S. (S(63-'S1 ,B+6-'S1. S. ! "S%& (%) % + (& , \$ ' 1 ! ! _ . . . (0 1 2 + . # (' 1 ' 1 . . . (0 1 2 + . # (' 1 ' 1 . . . + 1 - & 3 X 3 7 1 5 : / F / A ' # # ' 3 / R W W U L T / I L W / C"~? 7& OS.#11 R& IQQQ/ =5*~&N '1! .-D'3-N S. .#3# ###'3 '1 -3&E.. (&'8") D~-. '1 +1- &3 X 3 7 1 5 : (PBE/ V2S. R/ L/KUL&L/ C"~? 7& OS.#11 R& A+C6&E ; (=S31> ! (WUJ/ >4 "1-M, 5" N"~& S. (S(63-'S1 ,B+6-'S1. S. ! "S%& (%) % + (& , \$ ' 1 ! ! / 1 . . . (0 1 2 + . # (' 1 ' 1 . . . (0 1 2 + . # (' 1 ' 1 . . . + 1 - & 3 X 3 7 1 5 : / F / A ' # # ' 3 / R W W U L T / C"~? 7& V3 A< OS.#11 R& A+C6&E ; (WUJ/ >) " 1, B'1+ " S. #*~&E- S1 S1 ! "S%& (%) % + (& , \$ ' 1 ! ! _ . . . (0 1 2 + . # (' 1 ' 1 . . . (0 1 2 + . # (' 1 ' 1 . . . + 1 - & 3 X 3 7 1 5 : / F / A ' # # ' 3 / R W W U L T W / C"~? 7& V3 A< OS.#11 R& A+C6&E ; (WUJ/D/ 853" (S(63-'S1 !N' #*~. ,'+S& ~, '+1% ("2 '1! *~. '1! '#361". S. ! "S%& (%) % + (& , \$ ' 1 ! ! _ . . . (0 1 2 + . # (' 1 ' 1 . . . (0 1 2 + . # (' 1 ' 1 . . . + 1 - & 3 X 3 7 1 5 : / F / A ' # # ' 3 / R W W U L T / C"~? 7& V3 A< OS.#11 R& A+C6&E ; (WUJ/ > O'D~-. ("+*~ ! "S%& (%) % + (& , \$ ' 1 ! ! _ . . . (0 1 2 + . # (' 1 ' 1 . . . (0 1 2 + . # (' 1 ' 1 . . . + 1 - & 3 X 3 7 1 5 : / F / A ' # # ' 3 / R W W U L T W / C"~? 7& V3 A< OS.#11 R& A+C6&E ; (WUJ/ >) " 1, B'1+ " S. #*~&E- S1 S1 ! "S%& (%) % + (& , \$ ' 1 ! ! _ . . . (0 1 2 + . # (' 1 ' 1 . . . (0 1 2 + . # (' 1 ' 1 . . . + 1 - & 3 X 3 7 1 5 : / F / A ' # # ' 3 / R W W U L T W / C"~? 7& V3 A< OS.#11 R& A+C6&E ; (WUJ/ >) " 1, B'1+ " S. #*~&E- S1 S1 ! "S%& (%) % + (& , \$ ' 1 ! ! _ . . . (0 1 2 + . # (' 1 ' 1 . . . (0 1 2 + . # (' 1 ' 1 . . . + 1 - & 3 X 3 7 1 5 : / F / A ' # # ' 3 / R W W U L T W / C"~? 7& V3 A< OS.#11 R& A+C6&E ; (WUJ/ >) " 1, B'1+ " S. #*~&E- S1 S1 ! "S%& (%) % + (& , \$ ' 1 ! ! _ . . . (0 1 2 + . # (' 1 ' 1 . . . (0 1 2 + . # (' 1 ' 1 . . . + 1 - & 3 X 3 7 1 5 : / F / A ' # # ' 3 / R W W U L T W / C"~? 7& V3 A< OS.#11 R& A+C6&E ; (WUJ/ >) " 1, B'1+ " S. #*~&E- S1 S1 ! "S%& (%) % + (& , \$ ' 1 ! ! _ . . . (0 1 2 + . # (' 1 ' 1 . . . (0 1 2 + . # (' 1 ' 1 . . . + 1 - & 3 X 3 7 1 5 : / F / A ' # # ' 3 / R W W U L T W / C"~? 7& V3 A< OS.#11 R& A+C6&E ; (WUJ/ >) " 1, B'1+ " S. #*~&E- S1 S1 ! "S%& (%) % + (& , \$ ' 1 ! ! _ . . . (0 1 2 + . # (' 1 ' 1 . . . (0 1 2 + . # (' 1 ' 1 . . . + 1 - & 3 X 3 7 1 5 : / F / A ' # # ' 3 / R W W U L T W / C"~? 7& V3 A< OS.#11 R& A+C6&E ; (WUJ/ >) " 1, B'1+ " S. #*~&E- S1 S1 ! "S%& (%) % + (& , \$ ' 1 ! ! _ . . . (0 1 2 + . # (' 1 ' 1 . . . (0 1 2 + . # (' 1 ' 1 . . . + 1 - & 3 X 3 7 1 5 : / F / A ' # # ' 3 / R W W U L T W / C"~? 7& V3 A< OS.#11 R& A+C6&E ; (WUJ/ >) " 1, B'1+ " S. #*~&E- S1 S1 ! "S%& (%) % + (& , \$ ' 1 ! ! _ . . . (0 1 2 + . # (' 1 ' 1 . . . (0 1 2 + . # (' 1 ' 1 . . . + 1 - & 3 X 3 7 1 5 : / F / A ' # # ' 3 / R W W U L T W / C"~? 7& V3 A< OS.#11 R& A+C6&E ; (WUJ/ >) " 1, B'1+ " S. #*~&E- S1 S1 ! "S%& (%) % + (& , \$ ' 1 ! ! _ . . . (0 1 2 + . # (' 1 ' 1 . . . (0 1 2 + . # (' 1 ' 1 . . . + 1 - & 3 X 3 7 1 5 : / F / A ' # # ' 3 / R W W U L T W / C"~? 7& V3 A< OS.#11 R& A+C6&E ; (WUJ/ >) " 1, B'1+ " S. #*~&E- S1 S1 ! "S%& (%) % + (& , \$ ' 1 ! ! _ . . . (0 1 2 + . # (' 1 ' 1 . . . (0 1 2 + . # (' 1 ' 1 . . . + 1 - & 3 X 3 7 1 5 : / F / A ' # # ' 3 / R W W U L T W / C"~? 7& V3 A< OS.#11 R& A+C6&E ; (WUJ/ >) " 1, B'1+ " S. #*~&E- S1 S1 ! "S%& (%) % + (& , \$ ' 1 ! ! _ . . . (0 1 2 + . # (' 1 ' 1 . . . (0 1 2 + . # (' 1 ' 1 . . . + 1 - & 3 X 3 7 1 5 : / F / A ' # # ' 3 / R W W U L T W / C"~? 7& V3 A< OS.#11 R& A+C6&E ; (WUJ/ >) " 1, B'1+ " S. #*~&E- S1 S1 ! "S%& (%) % + (& , \$ ' 1 ! ! _ . . . (0 1 2 + . # (' 1 ' 1 . . . (0 1 2 + . # (' 1 ' 1 . . . + 1 - & 3 X 3 7 1 5 : / F / A ' # # ' 3 / R W W U L T W / C"~? 7& V3 A< OS.#11 R& A+C6&E ; (WUJ/ >) " 1, B'1+ " S. #*~&E- S1 S1 ! "S%& (%) % + (& , \$ ' 1 ! ! _ . . . (0 1 2 + . # (' 1 ' 1 . . . (0 1 2 + . # (' 1 ' 1 . . . + 1 - & 3 X 3 7 1 5 : / F / A ' # # ' 3 / R W W U L T W / C"~? 7& V3 A< OS.#11 R& A+C6&E ; (WUJ/ >) " 1, B'1+ " S. #*~&E- S1 S1 ! "S%& (%) % + (& , \$ ' 1 ! ! _ . . . (0 1 2 + . # (' 1 ' 1 . . . (0 1 2 + . # (' 1 ' 1 . . . + 1 - & 3 X 3 7 1 5 : / F / A ' # # ' 3 / R W W U L T W / C"~? 7& V3 A< OS.#11 R& A+C6&E ; (WUJ/ >) " 1, B'1+ " S. #*~&E- S1 S1 ! "S%& (%) % + (& , \$ ' 1 ! ! _ . . . (0 1 2 + . # (' 1 ' 1 . . . (0 1 2 + . # (' 1 ' 1 . . . + 1 - & 3 X 3 7 1 5 : / F / A ' # # ' 3 / R W W U L T W / C"~? 7& V3 A< OS.#11 R& A+C6&E ; (WUJ/ >) " 1, B'1+ " S. #*~&E- S1 S1 ! "S%& (%) % + (& , \$ ' 1 ! ! _ . . . (0 1 2 + . # (' 1 ' 1 . . . (0 1 2 + . # (' 1 ' 1 . . . + 1 - & 3 X 3 7 1 5 : / F / A ' # # ' 3 / R W W U L T W / C"~? 7& V3 A< OS.#11 R& A+C6&E ; (WUJ/ >) " 1, B'1+ " S. #*~&E- S1 S1 ! "S%& (%) % + (& , \$ ' 1 ! ! _ . . . (0 1 2 + . # (' 1 ' 1 . . . (0 1 2 + . # (' 1 ' 1 . . . + 1 - & 3 X 3 7 1 5 : / F / A ' # # ' 3 / R W W U L T W / C"~? 7& V3 A< OS.#11 R& A+C6&E ; (WUJ/ >) " 1, B'1+ " S. #*~&E- S1 S1 ! "S%& (%) % + (& , \$ ' 1 ! ! _ . . . (0 1 2 + . # (' 1 ' 1 . . . 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(0 1 2 + . # (' 1 ' 1 . . . + 1 - & 3 X 3 7 1 5 : / F / A ' # # ' 3 / R W W U L T W / C"~? 7& V3 A< OS.#11 R& A+C6&E ; (WUJ/ >) " 1, B'1+ " S. #*~&E- S1 S1 ! "S%& (%) % + (& , \$ ' 1 ! ! _ . . . (0 1 2 + . # (' 1 ' 1 . . . (0 1 2 + . # (' 1 ' 1 . . . + 1 - & 3 X 3 7 1 5 : / F / A ' # # ' 3 / R W W U L T W / C"~? 7& V3 A< OS.#11 R& A+C6&E ; (WUJ/ >) " 1, B'1+ " S. #*~&E- S1 S1 ! "S%& (%) % + (& , \$ ' 1 ! ! _ . . . (0 1 2 + . # (' 1 ' 1 . . . (0 1 2 + . # (' 1 ' 1 . . . + 1 - & 3 X 3 7 1 5 : / F / A ' # # ' 3 / R W W U L T W / C"~? 7& V3 A< OS.#11 R& A+C6&E ; (WUJ/ >) " 1, B'1+ " S. #*~&E- S1 S1 ! "S%& (%) % + (& , \$ ' 1 ! ! _ . . . (0 1 2 + . # (' 1 ' 1 . . . (0 1 2 + . # (' 1 ' 1 . . . + 1 - & 3 X 3 7 1 5 : / F / A ' # # ' 3 / R W W U L T W / C"~? 7& V3 A< OS.#11 R& A+C6&E ; (WUJ/ >) " 1, B'1+ " S. #*~&E- S1 S1 ! "S%& (%) % + (& , \$ ' 1 ! ! _ . . . (0 1 2 + . # (' 1 ' 1 . . . (0 1 2 + . # (' 1 ' 1 . . . + 1 - & 3 X 3 7 1 5 : / F / A ' # # ' 3 / R W W U L T W / C"~? 7& V3 A< OS.#11 R& A+C6&E ; (WUJ/ >) " 1, B'1+ " S. #*~&E- S1 S1 ! "S%& (%) % + (& , \$ ' 1 ! ! _ . . . (0 1 2 + . # (' 1 ' 1 . . . (0 1 2 + . # (' 1 ' 1 . . . + 1 - & 3 X 3 7 1 5 : / F / A ' # # ' 3 / R W W U L T W / C"~? 7& V3 A< OS.#11 R& A+C6&E ; (WUJ/ >) " 1, B'1+ " S. #*~&E- S1 S1 ! "S%& (%) % + (& , \$ ' 1 ! ! _ . . . (0 1 2 + . # (' 1 ' 1 . . . (0 1 2 + . # (' 1 ' 1 . . . + 1 - & 3 X 3 7 1 5 : / F / A ' # # ' 3 / R W W U L T W / C"~? 7& V3 A< OS.#11 R& A+C6&E ; (WUJ/ >) " 1, B'1+ " S. #*~&E- S1 S1 ! "S%& (%) % + (& , \$ ' 1 ! ! _ . . . (0 1 2 + . # (' 1 ' 1 . . . (0 1 2 + . # (' 1 ' 1 . . . + 1 - & 3 X 3 7 1 5 : / F / A ' # # ' 3 / R W W U L T W / C"~? 7& V3 A< OS.#11 R& A+C6&E ; (WUJ/ >) " 1, B'1+ " S. #*~&E- S1 S1 ! "S%& (%) % + (& , \$ ' 1 ! ! _ . . . (0 1 2 + . # (' 1 ' 1 . . . 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 ! "%\$%& \ 23EE5 &7- 6#997/ S#9N##/ ! "%\$%& (-... (01+."# (, /: ! 5
 (%\$) \$%*(8, \$ 5 J- # '5 G.: (5 O. 95 3E HL FH35
 *\$S#9/ 'P) 8"/< - I(&(7S#9 \ J/: # %7/ P\ 233L5 G7: #/;: %8"KK (,
 , /: 9%Q /; S.7(7: > (<679-#%#% 8% /; - , Q# : , /: - , (%7 , 8/ ?#
 , 66"7. < N.9 > , %R#B: . #%5 A>7(5 G7/7; "5 4L 4EF22D5
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 -, -, (% , 9) 7; (\N# : #/ 7? 2342 F23DD5 '5 J/5 A>7(5 B3 EBMF
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 G7""%P) (23345 &7#W#9#># 7? %6#>., (%0, /: ; #/ #; (%0 7: #/ %K, <, S.9 9
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 O7""; < ! (! 76- 'Q. A LCC15 &<, /; #%. / ./: K: 8, (_ 8, (9- : 8"/; , MR
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 ! "%\$%& (5 \6#>5 I8S(A J- # '5 \>5 G; - - , (5 D BMB FB445
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 2F45

\#S# UJX 23AB5 J /79# 7/ - 8(96(#R#>, 638"# >#/%8%5). 7- #9. Q, BL
 LH3 FLB35
 \I\| (@\ LCC25 \I\| 2C'C'E??" G, >./9%<5 &<.; \ @*5
 +, .9 G' ! "%\$%& \ 23DB5 I768(, 97/: = /; - >%, /: >>#%5 @' +, -, "/ O1
 #: 5). 7(7: = ?? O#N] 7(: ! "%\$%& (5 \6#>5 I8S(5 O7' A J- 5 \>5
 G; - - , (5 BMB FB445
 +, -, "/ O1(23DH5) 7: = - , %%, %, > "9" 7/ 7? : %6#% (, > "9_8#5 '5
 G; - - , (5 4B 432 F43L5
 +, I.Q P(U#9" *% LCCE5 @9%"6#>?> 9%" 9", (9- ./ ! "%\$%& (%\$) \$%*(8, \$
 , /: ! 5 -... (01+."# (5 I", . " # O. 95 MB H2 FHD5
 +<7- 6%7/ P\ 23AB5 Y77: 6"#%#>#% 7? 9# - #; : 7N K7(# ! "%\$%& (,
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 [#/ # " * U#9" *% (3DB5 \; /; .?> /># 7? : %6#% (./ \8>8, 9/; 6768(, 97/%
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 J < 9 U\X) 8"/< - ! I(23335 I "7; " - G.JO! %8"KK (#90- , 97/ 7?7-
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 , /: - , (6768(, 97/%5 \, / P. #; ? J> : # - > I "#9%5
 S(Z# / I 233H5 [7# >>#% /; , /96#; , 9" = S#<, K78"5 + #/; % A>7(5
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 X- - # - , / AU 23AB5 J >7- 6, " %7/ 7? <, S.9 9, /: 77: %6#>#% 7? 9V7
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